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## PEER Kabul River Forum

# Satellite Enhanced Snowmelt Flood and Drought Predictions for the Kabul River Basin with surface and groundwater modeling

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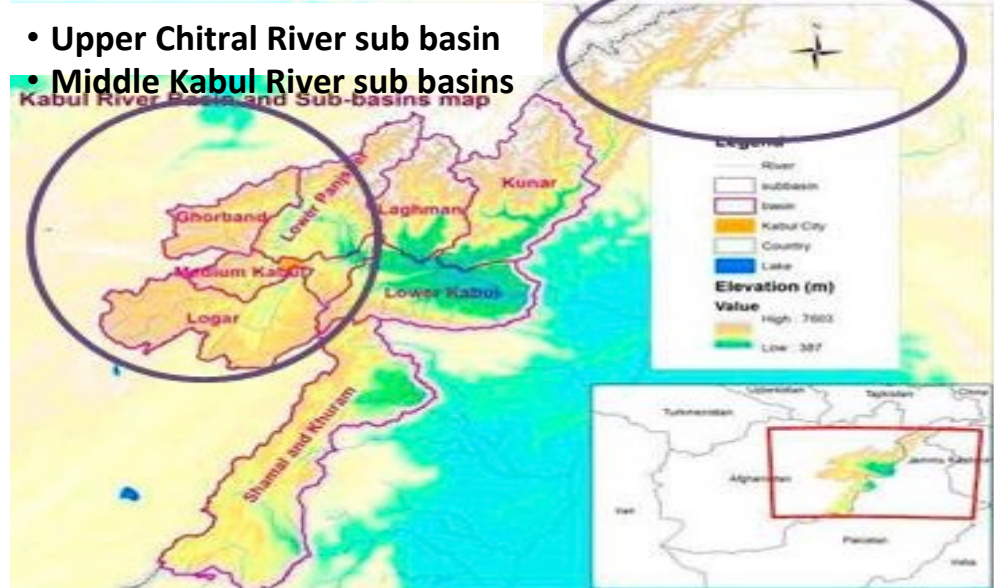
[drabid@ciitwah.edu.pk](mailto:drabid@ciitwah.edu.pk)

July 3<sup>rd</sup> 2017

- Afghanistan and Pakistan have complexities in water resources
- Need for Integrated snow and rainfall estimation and modeling for prediction of floods and droughts in Afghanistan and Pakistan
- Lack of unified prediction analysis and data source with the integrated surface and groundwater modeling

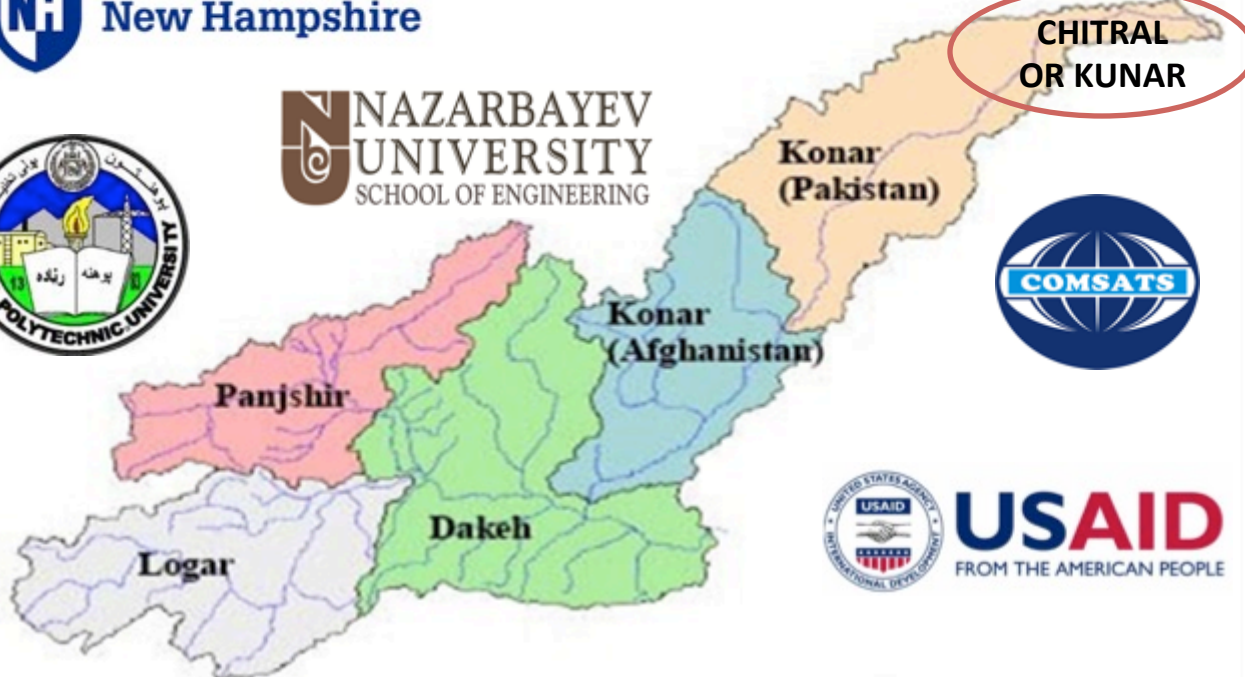
## Background

- Upper Chitral River sub basin
- Middle Kabul River sub basins



CHITRAL  
OR KUNAR

Joint project between  
Afghanistan, Pakistan,  
Kazakhstan and US  
institutions



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KABUL RIVER BASIN

# Scientific Objectives

Scientific objective is to develop:

1. KRB flood prediction models using satellite observations that capture the magnitude, timing, and spatial distribution of watershed scale with snowmelt parameters
2. Integrated surface and ground water modeling and prediction analyses

# Development Objectives

- 1) Web Geo Portal, RS & GIS
- 2) Snow-glacier melt modeling
- 3) Hydro – Meteorological modeling
- 4) Hydrological modeling
- 5) Hydraulic modeling, Flash Flood
- 6) Underground water modeling
- 7) Integrated water modeling

# Progress and Results

- **Data collection** for Chitral River Basin and KRB in progress
- **Development of Web portal** in progress to share data for use
- **Involvement of different institutions** and organizations including CCRD, Metrology, Geology, Focus foundation, Irrigation, Geography, MoWP, MoEW, Water resources, Climate Change, Hydrology, Civil Engineering, IWMI, Agricultural, Geophysics, Minerals, Remote sensing and GIS and others from Pak, Afg and CA countries.
- **CAWa summer school**, 3-17<sup>th</sup> June, 2017; organized by German GFZ, WB, UNESCO, USAID PEER
  - 60 MS-PhD level Female-Male participants from Central Asian region, incl. Afghanistan, Kazakhstan, Kyrgyzstan, Pakistan, Tajikistan, Turkmenistan, Uzbekistan
  - Identification and formulation of 7 sub-research group
    - Glacial and Integrated water modeling from Afg and pak sides
  - Post visit reports and way forward
- **UNDP cooperation** for RS droughts tracking, geoportal training, 22-24<sup>th</sup> June, 2017
- **Cooperation with US-Canada Red River Basin** Commission (RRBC)
- **Cooperation with Research Organization for Development** (ROD)

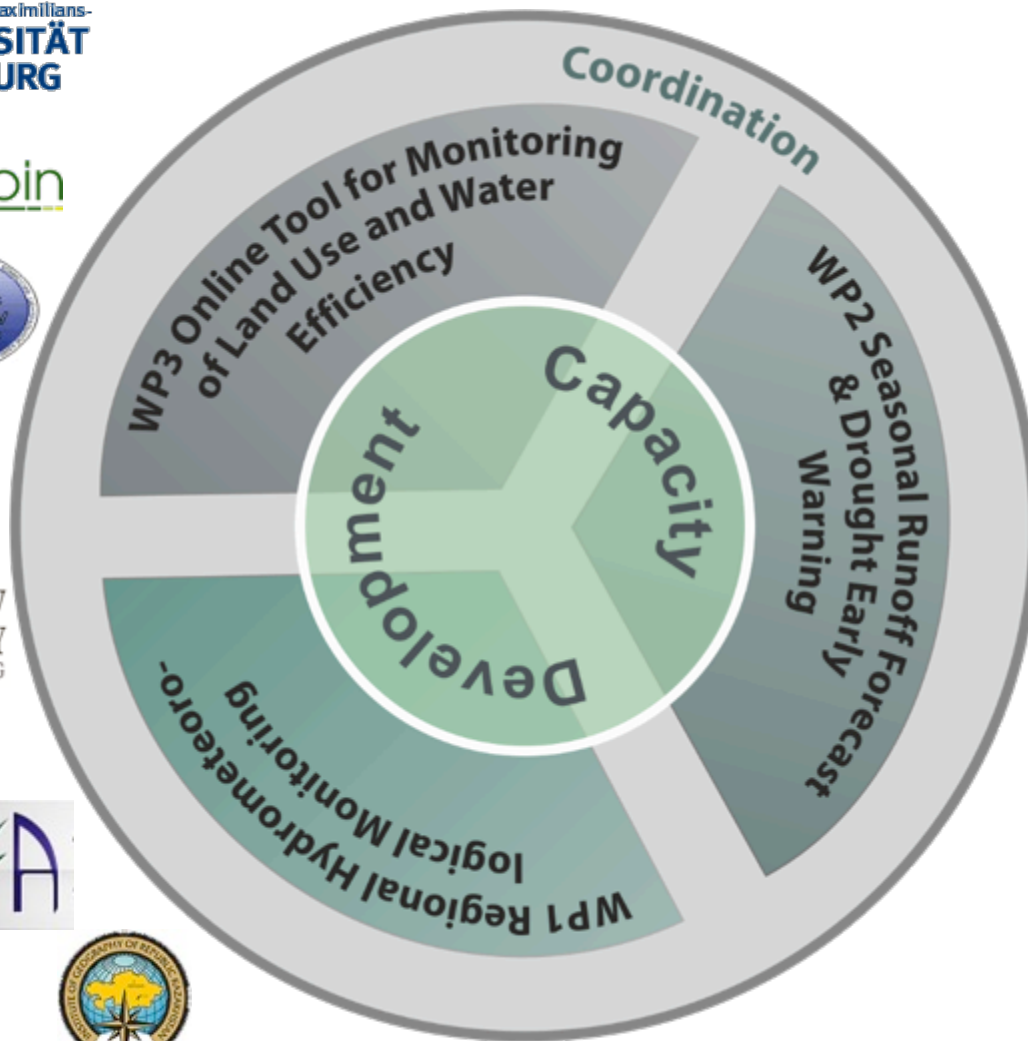


## 4<sup>TH</sup> CAWA SUMMER SCHOOL

METHODS AND TOOLS FOR THE ASSESSMENT AND MONITORING OF CENTRAL ASIAN WATER AND LAND  
RESOURCE





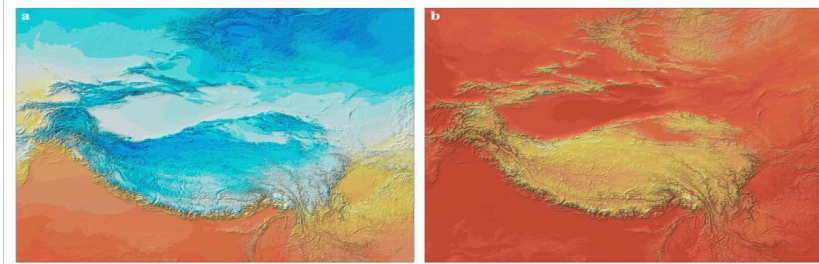
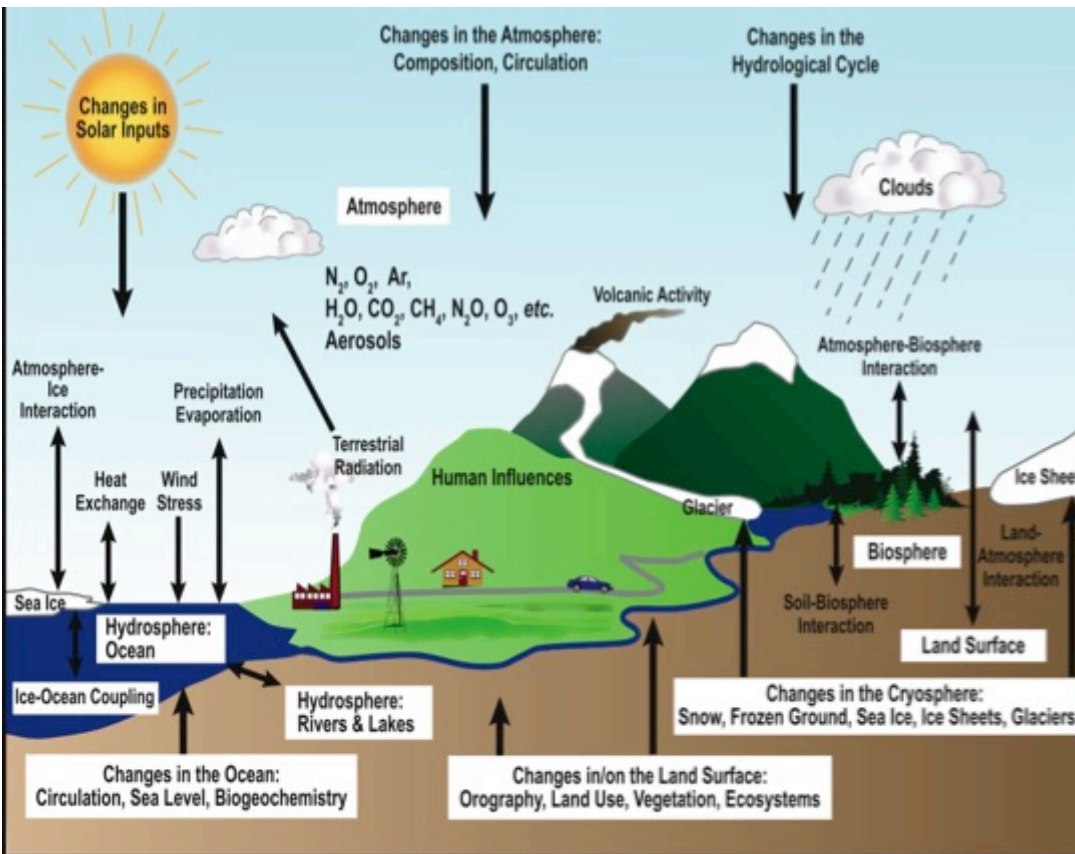


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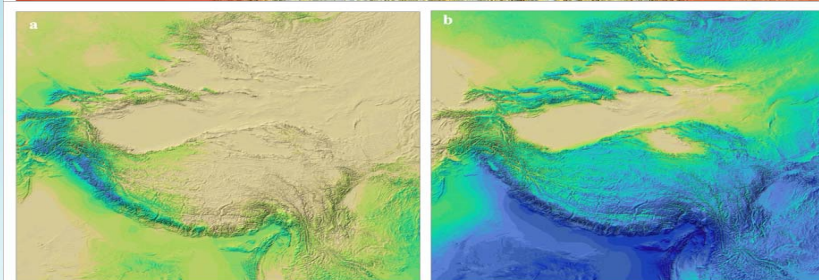
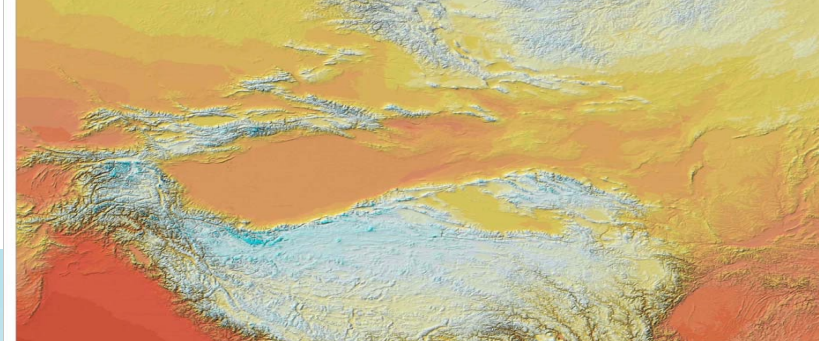


## Climate Models

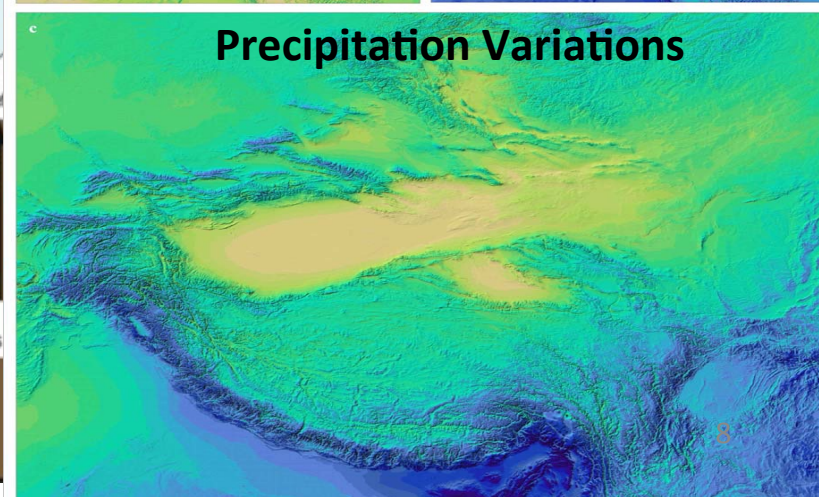
A powerful tool to overcome the observational shortcomings...



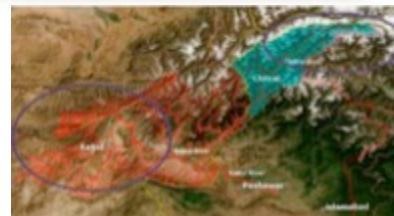
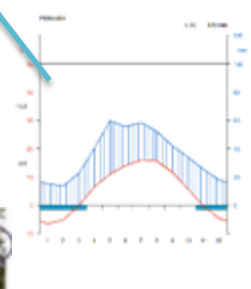
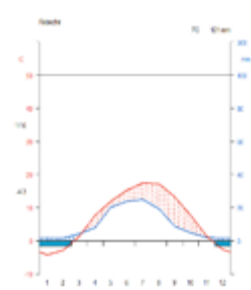
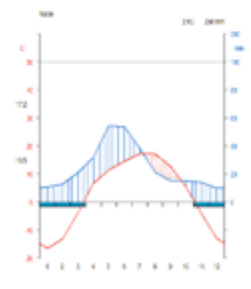
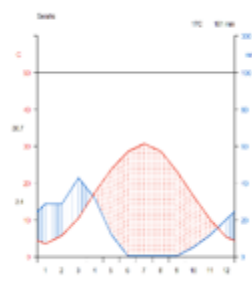
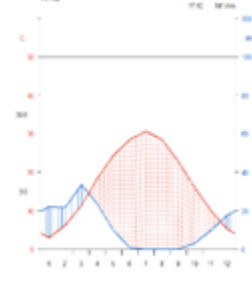
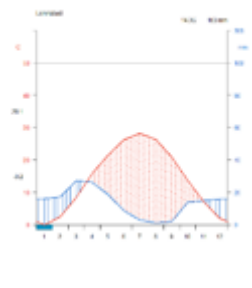
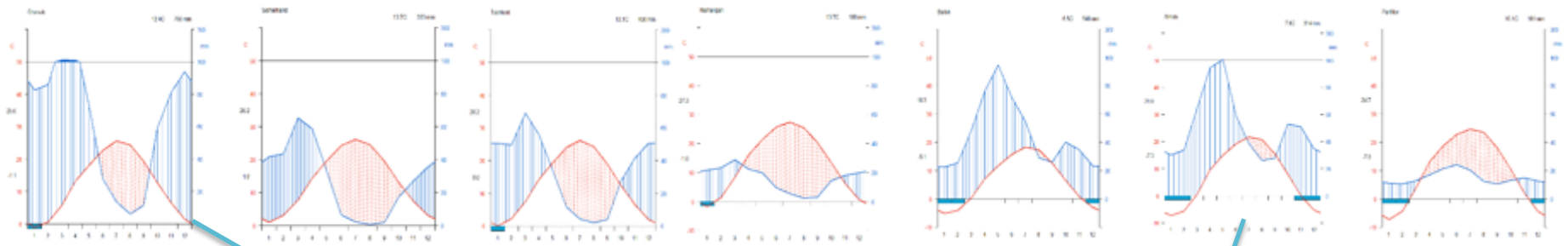
Temperature Variations



Precipitation Variations



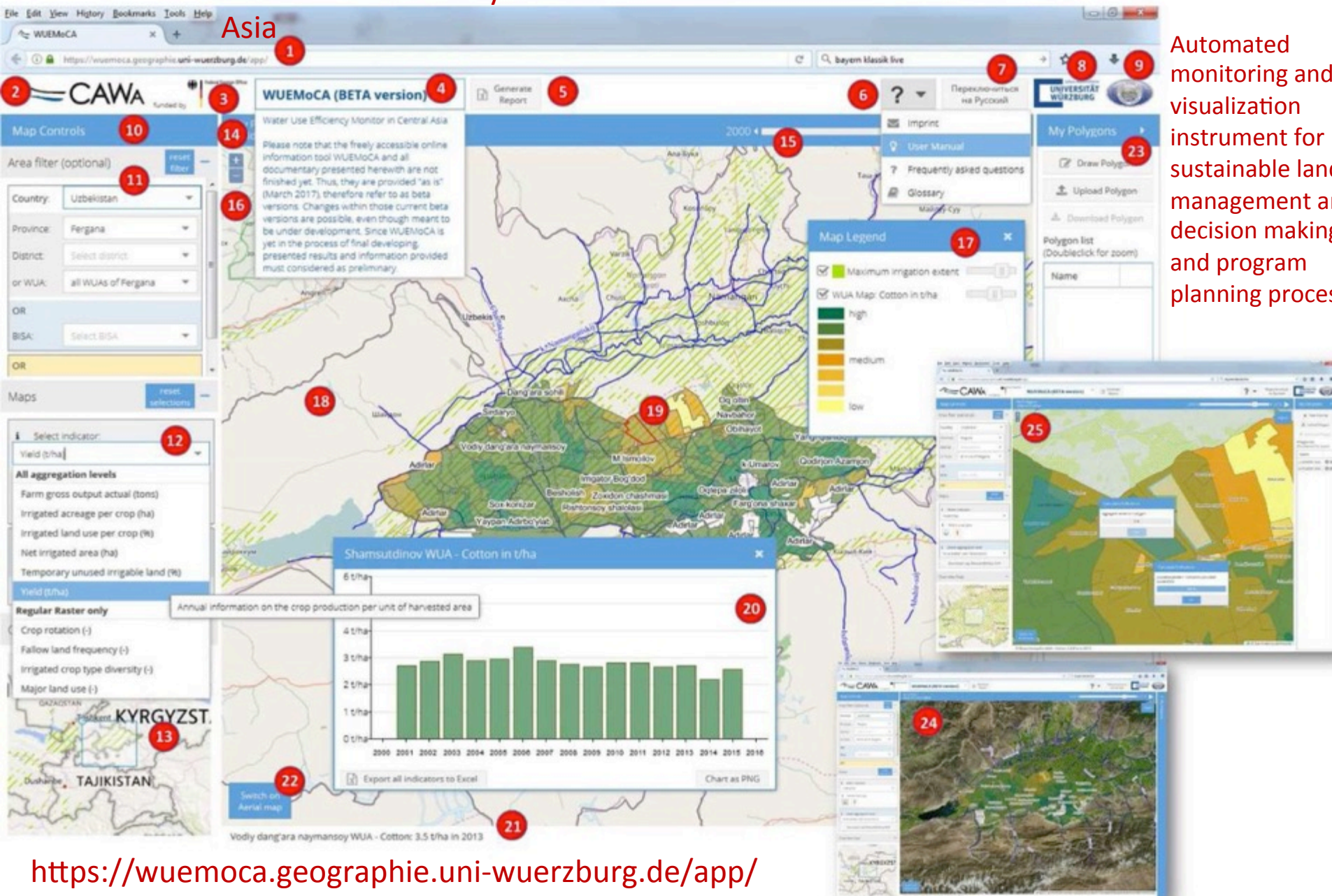




# WUEMoCA Features at a Glance – Beta Version

Water Use Efficiency Monitor in Central Asia

Automated monitoring and visualization instrument for sustainable land management and decision making and program planning process



<https://wuemoca.geographie.uni-wuerzburg.de/app/>





## US Army Corps of Engineers

Hydrologic Engineering Center



ABOUT NEWSLETTERS SOFTWARE PUBLICATIONS TRAINING VISITORS LINKS CONTACT

HOME > SOFTWARE > HEC-RAS

### HEC-RAS

HEC-RAS

Features

What's New

Downloads

Documentation

FAQs

Known Issues

Bug Report

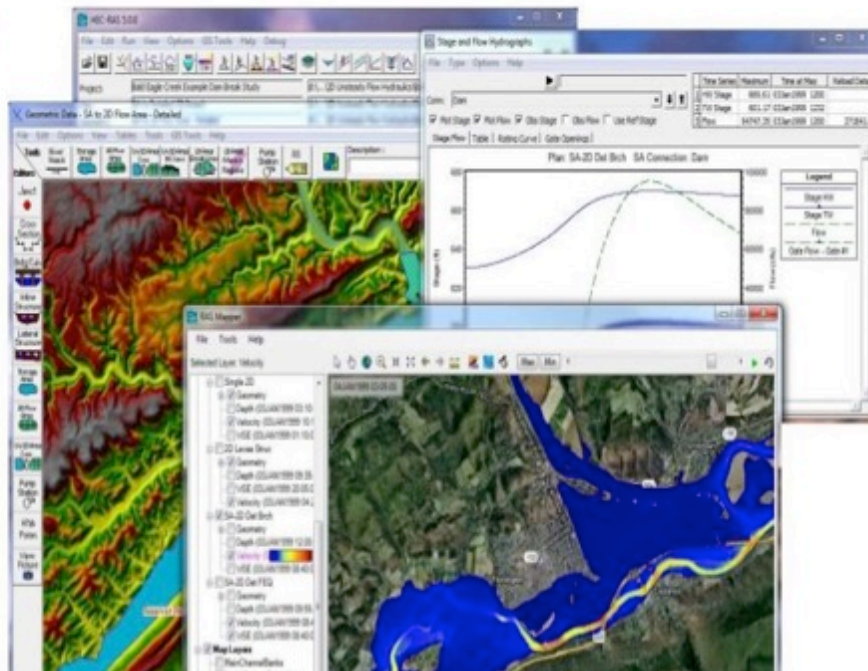
Suggestions

Demo

Sponsors


Collaborators

Support Online




- US Army Corps of Engineers (USACE) HEC RAS and HEC HMS modeling tools adaptation  
<http://www.hec.usace.army.mil/software/>

- USAID CHARIS: Contribution to High Asia Runoff from Ice & Snow project adaptation  
<http://nsidc.org/charis>


**NSIDC** National Snow & Ice Data Center

[DATA](#) [RESEARCH](#) [NEWS](#) [ABOUT](#) [SEARCH](#)



### Research Project: Contribution to High Asia Runoff from Ice & Snow (CHARIS)

This collaborative study assesses the role of glaciers and seasonal snow cover in the hydrology of the mountains of High Asia.

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[Home](#) [Current News](#) [Project Summary](#) [Methodology & Results](#) [People & Partners](#) [Publications, Posters, Presentations](#)



# RED RIVER BASIN DECISION INFORMATION NETWORK

"Shared Tools For Regional Problem Solving"

[HOME](#) | [ABOUT THE BASIN](#) | [DATA](#) | [TOOLS](#) | [COMMUNICATION](#) | [SEARCH](#) | [More Information -->](#)

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[Project Background](#)

[Geographic Setting](#)

[Historical Flooding](#)

[Historical Droughts](#)

[Organizations](#)

[Policies & Procedures](#)

[Links](#)

The Red River Basin of the North has a large stakeholder community. Most stakeholders are interested in water management. The idea is to provide as many resources about the basin as possible to help stakeholders find general information they can use about information that may be useful to other stakeholders, please submit [feedback](#) to us.



The US-Canada Red River Basin  
Commission

[https://  
www.redriverbasincommission](https://www.redriverbasincommission)

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[Home](#) >> [Data](#) >> Water Resource Models

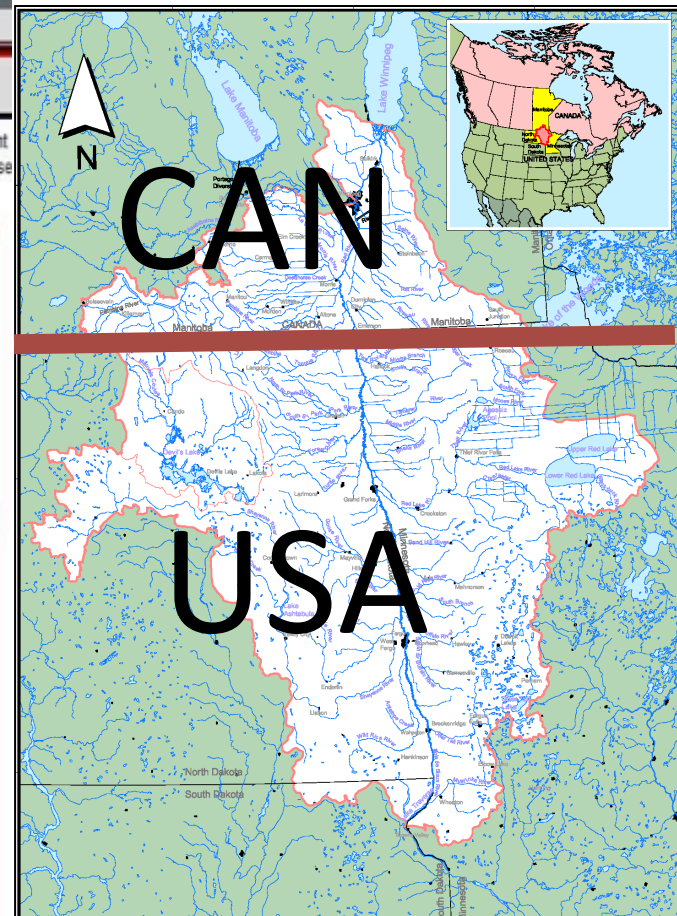
## Inventory of Models for the Red River Basin

(This is not a comprehensive inventory of models. It currently only contains hydrologic and hydraulic models that were provided from voluntary organizations. The inventory is meant to provide some general information and a contact organization for more information. For more information, please visit the [frequently ask questions](#) page. If you would like to add a model or make a correction, please contact the [webmaster](#) or fill out the [feedback form](#).)

[Browse](#) | [Locate on Map](#) | [Help](#)

View Details	USGS HUC Name	Detailed Location	Creation Date	Type of Model	Owner/Developer
		Juneberry	5/1/1990	Hydrology	JOR Engineering

## International Basin with Numerous Jurisdictions



- 2 Countries
- 3 States
- 1 Province
- Numerous Counties and Rural Municipalities

Red River Basin Decision I... x

www.rrbdin.org/data/lidar.jsp

# RED RIVER BASIN

## DECISION INFORMATION NETWORK

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[Home](#) >> [Data](#) >> [LIDAR](#)

### Light Detection and Ranging (LIDAR)

LIDAR is a remote sensing system that uses the speed of light to collect millions of digital elevation accuracy elevation products for a large area. There are many resources to learn more about LIDAR

[Home](#) >> [IWI LiDAR Tools](#)

[IWI LiDAR Viewer](#)

[IWI LiDAR Download Portal](#)

Tools and Services Provided by Other Organizations

- [North Dakota State Water Commission](#)
- [North Dakota GIS HUB](#)
- [Minnesota Geospatial Information Office](#)
- [USGS CLICK](#)

The Red River Basin Mapping Initiative (RRBMI) includes all or portions of 45 counties in N for a high-resolution digital elevation data collection project in the United States portion of GIS application to view and disseminate the LiDAR data. The IWI has developed an applic please visit the [IWI website](#).

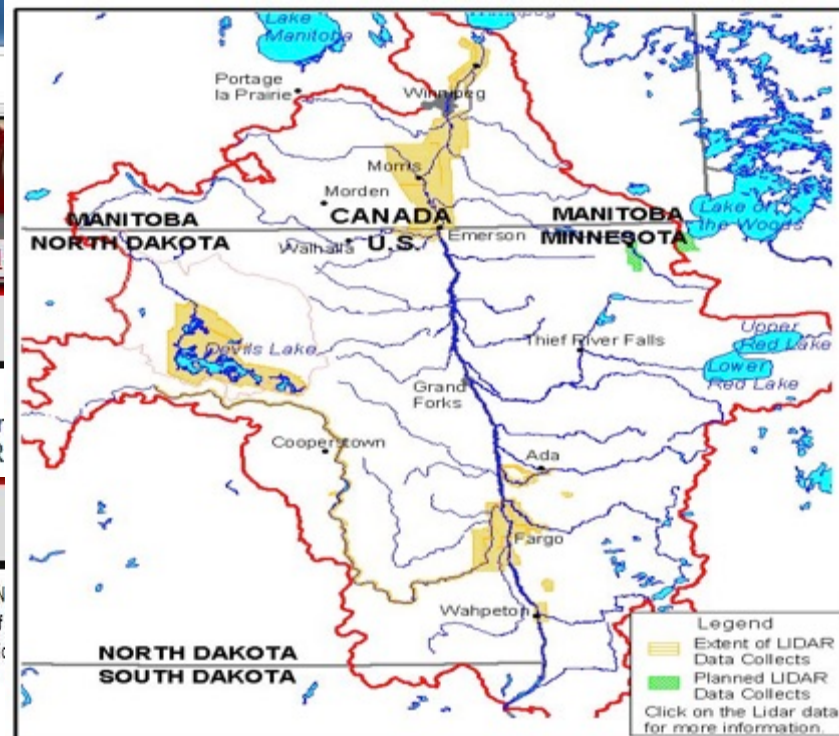
### What do you want to do?

- **Download IWI LiDAR data**
  - [Launch "IWI LiDAR Download Portal"](#)
  - [Help Page](#)
  - [IWI LiDAR Metadata](#)
  - [Aquisition Dates by Block](#)
- **View and print LiDAR data** (including 2ft contours)
  - [Launch "IWI LiDAR Viewer"](#)
  - [Help Page](#)
- **View LiDAR data in GIS desktop software**

ArcGIS Software

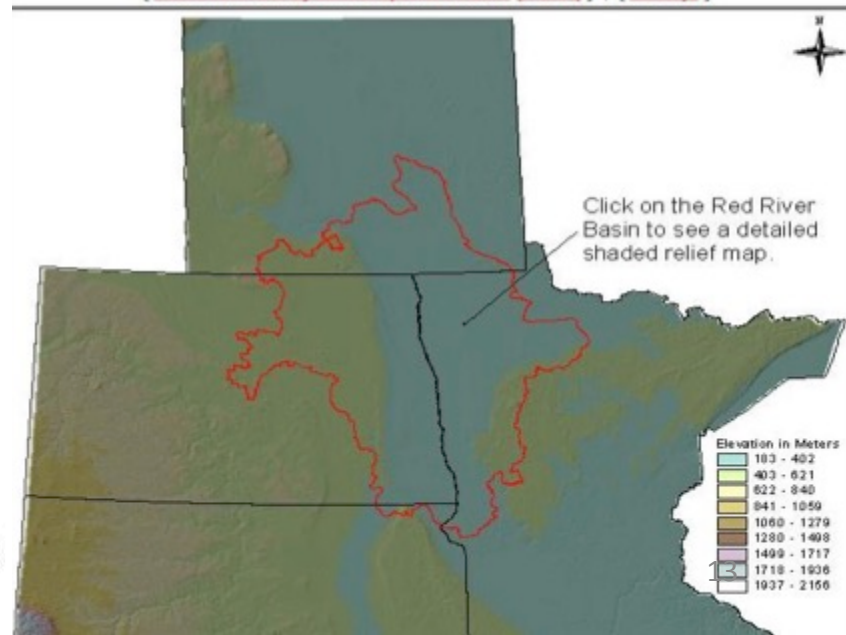
  - [Instructions to Add WMS service from ND GIS HUB](#)
  - Includes DEM and Shaded Relief Images
  - [Instructions to Add WMS service from MnDNR](#)
  - Includes 2ft contours
  - [Instructions to Add 2008/9 Red River Aerial Photos from MnGeo](#)
  - Includes 1ft resolution aerial photos for the Red River valley

Google Earth (Instructions Coming Soon)



[ Digital Elevation Models (DEM) ] | [ Light Detection and Ranging (LIDAR) ]

[ Interferometric Synthetic Aperture Radar (IFSAR) ] | [ Surveys ]







موسسه تحقیقات برای انکشاف  
نهاد علمی و تحقیقاتی برای توانمند ساختن افغان ها

Researches  
Organization for  
Development



## Researches Organization for Development (ROD)



For further information please contact us:

[info@rod.af](mailto:info@rod.af) 0770 444 333



**Precip. Data (Snow-Rain) & RS: GPM-  
GPCP (GEWEX), MERRA, MODIS,  
Radarsat, Landsat**

**Field Observation - GPR Snow-Rain, Soil  
& Land use (hydraulic conductivity):  
Spring, Summer, Fall, Winter**



**RS data processing  
ERDAS, ENVI, PCI  
Geomatics, ECognition**



**GIS**



**Input data for modeling: 1) Precip-SWE, 2) surface water-snow coverage, 3) discharge,  
4) hydraulic conductivity, 5) water level**



**GIS-HAZUS MODELING**

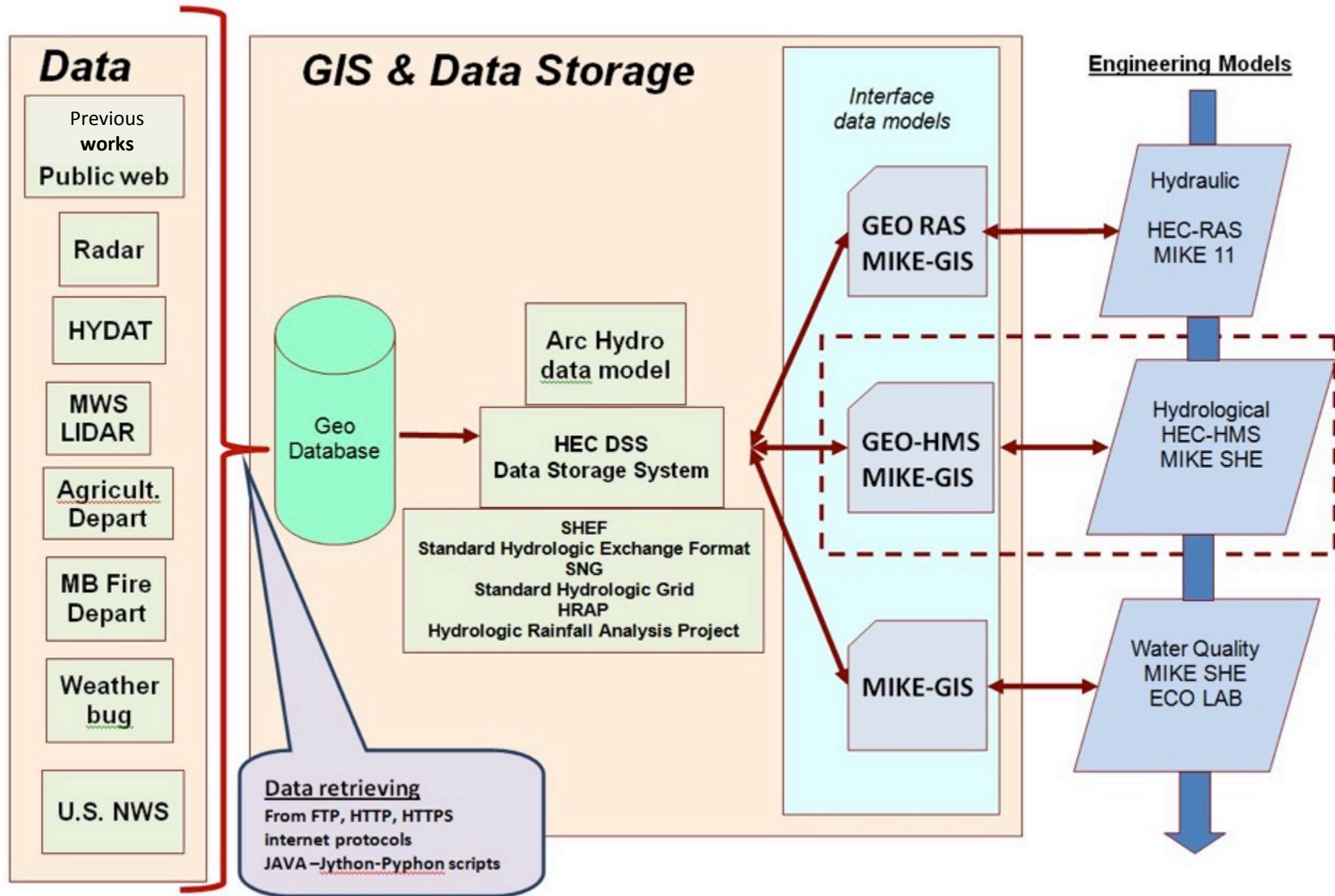
Dynamic Hydrological  
Modeling  
Statistics  
Finance



**Output: Surface water coverage – Discharge-Precipitation-Water Level**



**Result users: Disaster Agencies, WSA – Flood Drought Disaster, Local Communities -Municipalities, Nat  
Resource Oil & Gas Mining companies, MASAS-X (Multi-Agency Situational Awareness Systems)**



Engineering works



## Geodesy Polygon NU



GPS R8 GNSS Trimble (  
<http://www.trimble.com>).

LEICA <http://www.leica.com>

## GPS





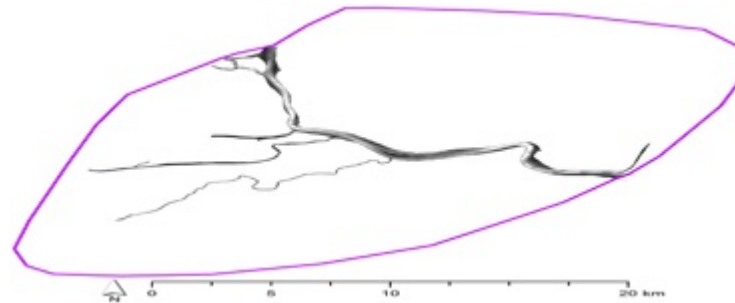
# DEM-DSM-DTM

**DEM** (Digital Elevation Models)

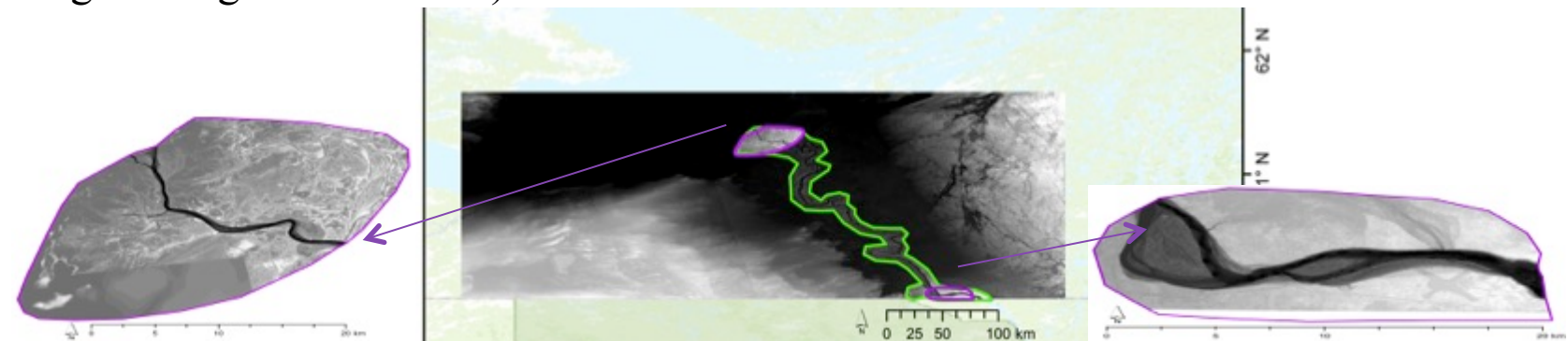
**DSM** (height of the surface objects above the mean sea level.)



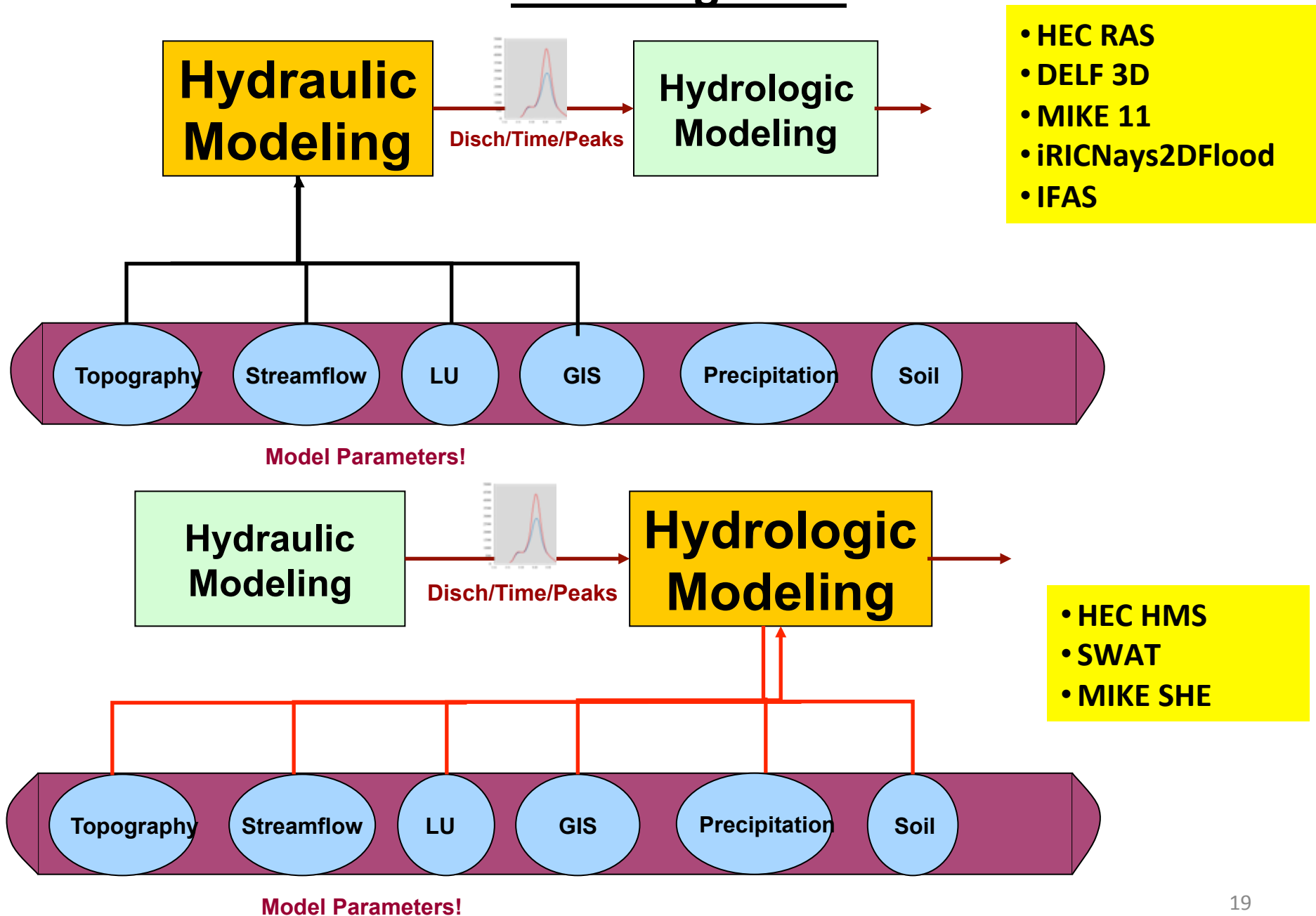
**Bathymetry**



**DTM** (the earth height without all surface objects, including vegetation, water bodies and engineering constructions)



# Modeling Tools



# Data Sharing and Dissemination

- Needs

Web Geo Portal, similar to RRBC, data for modeling

- Challenges

1) high resolution, 1-5 m, DEM-DSM-DTM

2) discharge gaging data on the country borders

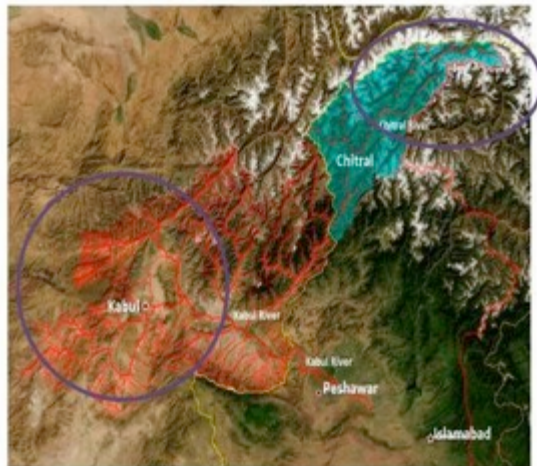


Figure 1. Satellite Image of Chitral-Kabul River

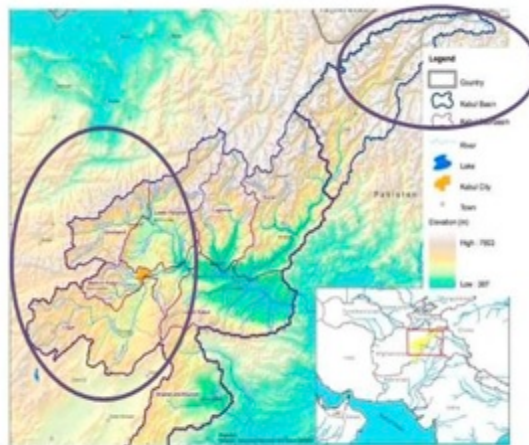


Fig. 4. Presents Kabul basin topography

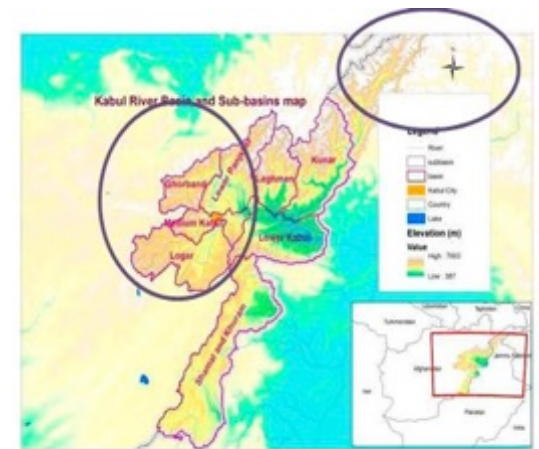


Fig. 1. Shows Kabul River Basin's and Sub-basins



# Engaging with Policy Makers

- Desired Audience
  - BS-MS-PhD level students and researchers, ROD
  - Ministers, River Basin Committees, Farmers
  - Advisors: RRBC, ISTS, IWRI
- Challenges
  - Transparency
  - RRBC, ISTS, IWRI
  - RS & GIS & Modeling



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[drabid@ciitwah.edu.pk](mailto:drabid@ciitwah.edu.pk)

# Thank you